# VELOONUS: A COMPUTATIONAL TOOL FOR BALLOON TRAJECTORIES IN VENUS

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## ABSTRACT

## (STUDENT CONTRIBUTION)

Venus and the Earth have many similarities in terms of mass, size, bulk composition and distance from the Sun. This makes Venus exploration interesting because it can provide clues about the evolution of the solar system and the future of the Earth. At the same time, Venus is very different because of the extreme environment of both the atmosphere and the surface. This duality makes Venus extremely attractive to the scientific community. Why a planet that could be our twin is such a hostile place to life? Could our Earth evolve in the same way as Venus? Venus exploration could respond to many questions related to the climate change and the history of water on our planet.

For these reasons, the tool presented in this paper aims at contributing to the wide range of space exploration activities, with Venus as the target of interest. A Matlab code for predicting Venusian trajectories of a balloon has been implemented, helped by an optimization process using a genetic algorithm (GA). The motivation for the project is to help concepts such as VME and EVE become closer to real implementation. Given the desired targets to overfly, the optimal departure point of the balloon has been determined using the genetic algorithm. Then, the trajectory of the balloon is propagated with the developed code, which uses the atmospheric VIRA model and windfields as inputs and simulates the thermal and aerodynamic behaviour of the balloon. The paths are calculated with two approaches: a physical model and an "optimised theoretical trajectory" computed with GA, and finally these are compared and discussed.